NAK1-BB92b

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Hiroyoshi Tanaka et al.

Serial No.:

Filed:

For: PLASMA DISPLAY PANEL SUITABLE FOR HIGH-QUALITY DISPLAY AND PRODUCTION METHOD

Previous Examiner: Day, M.

Group Art Unit: 2879

September 26, 2001

Irvine, California 92614

PRELIMINARY AMENDMENT

Honorable Commissioner of Patents
Washington, D.C. 20231

Dear Sir:

Prior to an examination on the merits of the above-identified application, please enter the following amendments:

In the Specification:

Please add the following paragraph before the paragraph beginning on page 1, line 3:

--This is a divisional application of U.S. Serial No. 09/692,437 filed October 19, 2000, that is a divisional application of U.S. Serial No. 08/979,752, issued as U.S. Patent No. 6,160,345 on December 12, 2000. --

On Table 1.A, please enter a page number - -56 --.

On Table 1.B, please enter a page number -- 57 --.

On Table 2, please enter a page number --58 --.

On Table 3, please enter a page number --59--.

On page 56, please delete "56" and enter -- 60--.

On page 57, please delete "57" and enter -- 61--.

On page 58, please delete "58" and enter -- 62--.

On page 59, please delete "59" and enter -- 63--.

On page 60, please delete "60" and enter -- 64--.

On page 61, please delete "61" and enter -- 65--.

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On page 62, please delete "62" and enter -- 66--.

On page 63, please delete "63" and enter -- 67--.

On page 64, please delete "64" and enter -- 68--.

On page 65, please delete "65" and enter -- 69--.

On page 66, please delete "66" and enter -- 70--.

On page 67, please delete "67" and enter -- 71--.

On page 68, please delete "68" and enter -- 72--.

On page 69, please delete "69" and enter -- 73--.

On page 70, please delete "70" and enter -- 74--.

<u>In the Claims</u>:

Please cancel claims 1 – 29 and 36 - 48 without prejudice or disclaimer of the subject matter contained therein.

REMARKS

The present application is a divisional application of U.S. Serial No. 09/692,437 resulting from a Restriction Requirement.

The proposed amendments to the specification are to correct minor typographical errors and do not add any new matter to the application.

Attached hereto is a PTO Form 1449 indicating prior art that was cited in the prosecution of U.S. Serial No. 08/979,714.

If the Examiner believes that a telephone interview will help further the prosecution of this case, the Examiner is respectfully requested to contact the undersigned attorney at the listed telephone number.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 16-2462 for any additional fees required under 37 C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

PRICE AND GESS

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

Please see attached pages.

TABLE 1.A

EXAMPLE NUMBER	ELECTRODE MATERIAL	METALLIC OXIDE ON ELECTRODE	COMPOSITION OF DIELECTRIC GLASS LAYER (% BY WEIGHT) PbO	B_2O_3	SiO_2	Al_2O_3	TiO_2	DIELECTRIC CONSTANT ε	THICKNESS OF GLASS	THE NUMBER OF PANELSCAUSING WITH STAND VOLTAGE FAILURE IN 20 PANELS AFTER AGING ON 150V AND 30 KHZ	PANEL BRIGHTNESS cd/m^2
1	Ag	CVD METHOD ZnO(0.5 μm)	78	11	10	1	0	10	13 μm	0	515
2	Ag	CVD METHOD ZrO_2(0.1 μm)	65	19	12	3	0	11	14 μm	0	512
3	Ag	CVD METHOD MgO(0.2 μm)	73	10	5	2	10	20	13 μm	0	516
4	Ag	CVD METHOD TiO_2(0.5 μm)	74	10	5	10	5	13	13 μm	0	513
5	Ag	CVD METHOD SiO_2(2.0 μm)	74	10	5	10	5	13	5 μm	0	526
6	Ag	CVD METHOD Al_2O_3(1.5 μm)	74	10	5	10	5	13	8 μm	0	520
8	Ag	CVD METHOD Cr_2O_3(1.0 μm)	74	10	5	10	5	13	10 μm	0	520
9	Cr-Cu-Cr	CVD METHOD SiO_2(5.0 μm)	0	0	10	0	0	—	0 μm	1	535
10	Cr-Cu-Cr	CVD METHOD Al_2O_3(3.0 μm)	0	0	10	0	0	—	0 μm	1	540
11	Cr-Cu-Cr	CVD METHOD ZnO(6 μm)	0	0	10	0	0	—	0 μm	1	530
12	Ag	CVD METHOD Al_2O_3(0.1 μm) SiO_2(0.3 μm)	74	10	5	10	5	13	12 μm	0	520
13	Ag	NO METALLIC OXIDE	74	10	5	10	5	13	20 μm	10	475

TABLE 1.B

EXAMPLE NUMBER	ELECTRODE MATERIAL	METALLIC OXIDE ON ELECTRODE	COMPOSITION OF DIELECTRIC GLASS LAYER (% BY WEIGHT)						DIELECTRIC CONSTANT ε	THICKNESS OF GLASS	THE NUMBER OF PANELSCAUSING WITH STAND VOLTAGE FAILURE IN 20 PANELS AFTER AGING ON 150V AND 30 KHZ	PANEL BRIGHTNESS cd/m^2
			PbO	B_2O_3	SiO_2	Al_2O_3	TiO_2					
14	Ag	CVD METHOD ZnO(0.1 μm)	45	23	22	5	5	0	12	14 μm	0	510
15	Ag	CVD METHOD ZrO_2(0.3 μm)	45	20	20	5	5	5	18	13 μm	0	512
16	Ag	CVD METHOD MgO(0.5 μm)	30	37	10	3	10	10	24	13 μm	0	513
17	Ag	CVD METHOD TiO_2(1.0 μm)	40	25	23	2	3	7	20	12 μm	0	515
18	Ag	CVD METHOD SiO_2(1.0 μm)	〃	〃	〃	〃	〃	〃	〃	11 μm	0	515
19	Ag	CVD METHOD Al_2O_3(0.5 μm)	〃	〃	〃	〃	〃	〃	〃	12 μm	0	514
20	Ag	CVD METHOD Cr_2O_3(0.3 μm)	〃	〃	〃	〃	〃	〃	〃	12 μm	0	514
21	Cr-Cu-Cr	CVD METHOD ZnO(6 μm)	0	0	0	0	0	0	—	0	1	520
22	Cr-Cu-Cr	CVD METHOD Cr_2O_3(5 μm)	0	0	0	0	0	0	—	0	2	519
23	Ag	CVD METHOD SiO_2(0.5 μm) TiO_2(0.2 μm)	40	25	23	2	3	7	20	10 μm	0	520
24*	Ag	NO METALLIC OXIDE	40	25	23	2	3	7	20	15 μm	8	480

* EXAMPLE NUMBER 13 AND 24 FOR COMPARISON

TABLE 2

EXAMPLE NUMBER	GLASS SUBSTRATE										
	PRODUCT NAME	MANUFACTURER	DISTORTION POINT (°C)	SPECIFIC GRAVITY OF GLASS (g/cm^3)	THEMAL EXPANSION COFFICIENT ($\times 10^{-1}$/C)	COMPOSITION OF GLASS (% BY WEIGHT) *RO(MgO,CaO,SrO,BaO) **R2O(Na2O,K2O)					THICKNESS OF GLASS SUBSTRATE (mm)
						SiO_2	Al_2O_3	B_2O_3	RO* (ALKALINE EARTH)	R_2O* (ALKALI)	
25	OA-2	NIHON ELECTRIC GLASS CO.	650	2.73	47	56	15	2	27	0	1.0
26	OA-2	NIHON ELECTRIC GLASS CO.	650	2.73	47	56	15	2	27	0	0.7
27	BLC	NIHON ELECTRIC GLASS CO.	535	2.36	51	72	5	9	7.5	6.5	1.5
28	BLC	NIHON ELECTRIC GLASS CO.	535	2.36	51	72	5	9	7.5	6.5	1.0
29	NA45	NH TECHNO GLASS CO.	610	2.78	46	49	11	15	25	0	1.0
30	NA45	NH TECHNO GLASS CO.	610	2.78	46	49	11	15	25	0	0.5
31	NA-35	NH TECHNO GLASS CO.	650	2.50	39	56	15	2	27	0	1.5
32	NA-35	NH TECHNO GLASS CO.	650	2.50	39	56	15	2	27	0	0.1
33*	SODA LIME GLASS(AS)	ASAHI GLASS CO.	511	2.49	85	72.5	2	0	12	13.5	2.7
34*	SODA LIME GLASS(AS)	ASAHI GLASS CO.	511		85	72.5	2	0	12	13.5	1.5
35*	PD-200	ASAHI GLASS CO.	570	2.77	84	58	7	0	21	14	2.7
36*	PD-200	ASAHI GLASS CO.	570	2.77	84	58	7	0	21	14	1.5

* EXAMPLE NUMBER 9-12 FOR COMPARISON

TABLE 3

EXAMPLE NUMBER	DIELECTRIC LAYER FORMING METHOD	DIELECTRIC LAYER COMPOSITION OF DIELECTRIC LAYER (% BY WEIGHT)	DIELECTRIC LAYER THERMAL EXPANSION COEFFICIENT ($\times 10^{-7}$/°C)	PROTECTING LAYER (FORMING METHOD AND FACE ORIENTATION)	PARTITION WALL (FORMING METHOD AND MATERIAL)	PANEL WEIGHT (WITHOUT CIRCUIT)	PANEL STATE DURING OPERATION	CHANGING RATE OF PANEL BRIGHTNESS AFTER OPERATION ON 200V FOR 5000H(%)
25	THERMAL SPRAYING METHOD	PbO(30), B_2O_3(20) SiO_2(45), Al_2O_3(5)	45	THERMAL CVD METHOD MGO WITH (100)-FACE ORIENTATION	THERMAL SPRAYING METHOD Al_2O_3(ALUMINA)	3.0kg	NO CRACK IN DIELECTRIC GLASS	-2.9
26	THERMAL CVD METHOD	Al_2O_3	70	THERMAL CVD METHOD MGO WITH (100)-FACE ORIENTATION	THERMAL SPRAYING METHOD Al_2O_3(ALUMINA)	2.1kg	NO CRACK IN DIELECTRIC GLASS	-2.5
27	THERMAL SPRAYING METHOD	P_2O_5(45), ZnO(34) Al_2O_3(18), CaO(3)	50	PLASMA CVD METHOD MGO WITH (100)-FACE ORIENTATION	THERMAL SPRAYING METHOD MULLITE($3Al_2O_3 \cdot 2SiO_2$)	3.9kg	NO CRACK IN DIELECTRIC GLASS	-2.8
28	PLASMA CVD METHOD	$3Al_2O_3 \cdot 2SiO_2$	50	PLASMA CVD METHOD MGO WITH (100)-FACE ORIENTATION	THERMAL SPRAYING METHOD MULLITE($3Al_2O_3 \cdot 2SiO_2$)	2.6kg	NO CRACK IN DIELECTRIC GLASS	-2.7
29	THERMAL SPRAYING METHOD	PbO(30), B_2O_3(20) SiO_2(45), Al_2O_3(5)	45	PLASMA CVD METHOD MGO WITH (100)-FACE ORIENTATION	THERMAL SPRAYING METHOD MULLITE($3Al_2O_3 \cdot 2SiO_2$)	3.1kg	NO CRACK IN DIELECTRIC GLASS	-2.7
30	THERMAL SPRAYING METHOD	P_2O_5(45), ZnO(34) Al_2O_3(18), CaO(3)	50	PLASMA CVD METHOD MGO WITH (100)-FACE ORIENTATION	THERMAL SPRAYING METHOD MULLITE($3Al_2O_3 \cdot 2SiO_2$)	1.54kg	NO CRACK IN DIELECTRIC GLASS	-2.6
31	PLASMA CVD METHOD	SiO_2	30	PLASMA CVD METHOD MGO WITH (100)-FACE ORIENTATION	THERMAL SPRAYING METHOD MULLITE($3Al_2O_3 \cdot 2SiO_2$)	4.1kg	NO CRACK IN DIELECTRIC GLASS	-2.9
32	PLASMA CVD METHOD	SiO_2	30	PLASMA CVD METHOD MGO WITH (100)-FACE ORIENTATION	THERMAL SPRAYING METHOD MULLITE($3Al_2O_3 \cdot 2SiO_2$)	0.28kg	NO CRACK IN DIELECTRIC GLASS	-3.0
33*	THERMAL SPRAYING METHOD	PbO(30), B_2O_3(20) SiO_2(45), Al_2O_3(5)	45	PLASMA CVD METHOD MGO WITH (100)-FACE ORIENTATION	THERMAL SPRAYING METHOD MULLITE($3Al_2O_3 \cdot 2SiO_2$)	7.4kg	CRACK IN DIELECTRIC SUBSTANCE	CRACK IN PANEL
34*	PLASMA CVD METHOD	Al_2O_3	70	PLASMA CVD METHOD MGO WITH (100)-FACE ORIENTATION	THERMAL SPRAYING METHOD MULLITE($3Al_2O_3 \cdot 2SiO_2$)	4.1kg	CRACK IN PANEL	—
35*	THERMAL SPRAYING METHOD	P_2O_5(45), ZnO(34) Al_2O_3(18), CaO(3)	50	PLASMA CVD METHOD MGO WITH (100)-FACE ORIENTATION	THERMAL SPRAYING METHOD MULLITE($3Al_2O_3 \cdot 2SiO_2$)	8.3kg	CRACK IN DIELECTRIC SUBSTANCE	CRACK IN PANEL
36*	PLASMA CVD METHOD	SiO_2	30	PLASMA CVD METHOD MGO WITH (100)-FACE ORIENTATION	THERMAL SPRAYING METHOD MULLITE($3Al_2O_3 \cdot 2SiO_2$)	5.0kg	CRACK IN PANEL	—

* EXAMPLE NUMBER 9-12 FOR COMPARISON

1. A PDP comprising:

a first plate which is provided with a first electrode on a main surface, the first electrode being made of silver, and the first electrode being coated with a first dielectric layer;

a second plate which is provided with a second electrode on a main surface, wherein the first plate and the second plate are placed in parallel so that the main surfaces of the first plate and the second plate face each other with a certain distance therebetween; and

spacing means which is provided between the first plate and the second plate so that a discharge space is formed between the first plate and the second plate, wherein

a first metallic oxide layer on whose surface OH groups exist is formed between the first electrode and the first dielectric layer, the first metallic oxide layer being 10μm or less in thickness.

2. The PDP defined in Claim 1, wherein

the first metallic oxide layer is formed with a CVD

method.

3. The PDP defined in Claim 1, wherein a thickness of the first dielectric layer is in a range of 5μm to 14μm.

4. The PDP defined in Claim 1, wherein the first metallic oxide layer is made of at least one of zinc oxide (ZnO), zirconium oxide (ZrO_2), magnesium oxide (MgO), titanium oxide (TiO_2), silicon oxide (SiO_2), aluminum oxide (Al_2O_3), and chromium oxide (Cr_2O_3).

5. The PDP defined in Claim 4, wherein the first dielectric layer is made of one of a lead oxide glass whose dielectric constant is 10 or more and a bismuth oxide glass whose dielectric constant is 10 or more, wherein the lead oxide glass includes lead oxide (PbO), boron oxide (B_2O_3), silicon oxide (SiO_2), and aluminum oxide (Al_2O_3), and the bismuth oxide glass includes bismuth oxide (Bi_2O_3), zinc oxide (ZnO), boron oxide (B_2O_3), silicon oxide (SiO_2), and calcium oxide (CaO).

6. The PDP defined in Claim 5, wherein

either of the lead oxide glass and the bismuth oxide glass used to form the first dielectric layer includes titanium oxide (TiO_2) in a range of 5% to 10% by weight and has a dielectric constant of 13 or more.

7. A PDP comprising:

a first plate which is provided with a first electrode on a main surface, the first electrode being made of a metal, and the first electrode being coated with a first dielectric layer;

a second plate which is provided with a second electrode on a main surface, wherein the first plate and the second plate are placed in parallel so that the main surfaces of the first plate and the second plate face each other with a certain distance therebetween; and

spacing means which is provided between the first plate and the second plate so that a discharge space is formed between the first plate and the second plate, wherein

a surface of the first electrode undergoes oxidation to be a metallic oxide.

8. The PDP defined in Claim 7, wherein

the metal used to make the first electrode is either of tantalum and aluminium.

9. A PDP comprising:

a first plate which is provided with a first electrode on a main surface, the first electrode being coated with a first dielectric layer;

a second plate which is provided with a second electrode on a main surface, wherein the first plate and the second plate are placed in parallel so that the main surfaces of the first plate and the second plate face each other with a certain distance therebetween; and

spacing means which is provided between the first plate and the second plate so that a discharge space is formed between the first plate and the second plate, wherein

the first electrode includes a transparent electrode part and a metallic electrode part, the transparent electrode part being placed on the main surface of the first plate and the metallic electrode part being placed on the transparent electrode part, and

a surface of the metallic electrode part undergoes

oxidation to be a metallic oxide;

10. A PDP comprising:

a first plate which is provided with a first electrode on a main surface, the first electrode being coated with a first dielectric layer;

a second plate which is provided with a second electrode on a main surface, wherein the first plate and the second plate are placed in parallel so that the main surfaces of the first plate and the second plate face each other with a certain distance therebetween; and

spacing means which is provided between the first plate and the second plate so that a discharge space is formed between the first plate and the second plate, wherein

the first dielectric layer is a layer made of a metallic oxide with a vacuum process method.

11. The PDP defined in Claim 10, wherein

the metallic oxide is one of zirconium oxide, titanium oxide, zinc oxide, bismuth oxide, cesium oxide, antimony oxide, aluminium oxide, silicon dioxide, and magnesium oxide.

12. The PDP defined in Claim 10, wherein

the first dielectric layer is formed with a CVD method and is 3μm-6μm in thickness.

13. The PDP defined in Claim 10, wherein

the first dielectric layer is coated with a magnesium oxide protecting layer.

14. The PDP defined in Claim 10, wherein

the first plate is made of borosilicate glass including 6.5% or less by weight of alkali.

15. The PDP defined in Claim 14, wherein

a thickness of the first plate is in a range of 0.1mm to 1.5mm.

16. The PDP defined in Claim 14, wherein

the borosilicate glass has a distortion point of 535°C or more and a thermal expansion coefficient of $51X10^{-7}$/°C or less.

17. A PDP comprising:

a first plate which is provided with a first electrode on a main surface, the first electrode being coated with a first dielectric layer;

a second plate which is provided with a second electrode on a main surface, wherein the first plate and the second plate are placed in parallel so that the main surfaces of the first plate and the second plate face each other with a certain distance therebetween; and

spacing means which is provided between the first plate and the second plate so that a discharge space is formed between the first plate and the second plate, wherein

the first dielectric layer is formed with a plasma spraying method.

18. The PDP defined in Claim 17, wherein

the first dielectric layer is made of one of a glass containing lead oxide (PbO), boron oxide (B_2O_3), silicon dioxide (SiO_2), and aluminium oxide (Al_2O_3), and a glass containing phosphorus oxide (P_2O_5), zinc oxide (ZnO), aluminium oxide (Al_2O_3), and calcium oxide (CaO), wherein

a thermal expansion coefficient of each of the glasses is in a range of $45X10^{-7}/°C$ to $50X10^{-7}/°C$.

19. The PDP defined in Claim 18, wherein

the first plate and the second plate are respectively made of borosilicate glass including 6.5% or less by weight of alkali.

20. A PDP comprising:

a first plate which is provided with a plurality of first electrodes on a main surface, the plurality of first electrodes being coated with a first dielectric layer;

a second plate which is provided with a plurality of second electrodes on a main surface, wherein the first plate and the second plate are placed in parallel so that the plurality of first electrodes and the plurality of second electrodes face each other with a certain distance between the first plate and the second plate; and

a plurality of partition walls which protrude from the main surface of either of the first plate and the second plate to partition a space between the first plate and the second plate so that a plurality of discharge spaces are formed, wherein

the plurality of partition walls are formed with a plasma spraying method.

21. The PDP defined in Claim 20, wherein each of the plurality of partition walls is made of at least one of aluminium oxide (Al_2O_3) and mullite ($3Al_2O_3 \cdot 2SiO_2$).

22. The PDP defined in Claim 21, wherein the fist plate and the second plate are respectively made of borosilicate glass including 6.5% or less by weight of alkali.

23. The PDP defined in Claim 21, wherein the plurality of partition walls, which protrude from the main surface of the first plate, and the second electrode are coated with a second dielectric layer.

24. A PDP comprising:

a first plate which is provided with a first electrode on a main surface, the first electrode being coated with a first dielectric layer;

a second plate which is provided with a second electrode on a main surface, wherein the first plate and the second plate are placed in parallel so that the main

surfaces of the first plate and the second plate face each other with a certain distance therebetween; and

spacing means which is provided between the first plate and the second plate so that a discharge space is formed between the first plate and the second plate, wherein

the first dielectric layer comprises a lower part and an upper part, the lower part, made of a metallic oxide, being formed on the first electrode with a vacuum process method and the upper part formed by applying and baking a dielectric glass on the lower part.

25. The PDP defined in Claim 1, wherein

a second dielectric layer is provided on the second electrode on the second plate, and

a second metallic oxide layer on whose surface OH groups exist is formed between the second electrode and the second dielectric layer, the second metallic oxide layer being 10μm or less in thickness.

26. The PDP defined in Claim 25, wherein

the second metallic oxide layer is formed with a CVD method.

27. The PDP defined in Claim 26, wherein a thickness of the second dielectric glass layer is in a range of 5μm to 14μm.

28. The PDP defined in Claim 25, wherein the second metallic oxide layer is made of at least one of zinc oxide (ZnO), zirconium oxide (ZrO_2), magnesium oxide (MgO), titanium oxide (TiO_2), silicon oxide (SiO_2), aluminum oxide (Al_2O_3), and chromium oxide (Cr_2O_3).

29. The PDP defined in Claim 7, wherein a second dielectric layer is provided on the second electrode and the second electrode is made of a metal, wherein a surface of the second electrode undergoes oxidation to be a metallic oxide.

30. A method for producing a PDP comprising: a first step of attaching a first electrode made of silver onto a main surface of a first plate and forming with a CVD method a layer made of a metallic oxide on a surface of the first electrode, wherein, on exposure to

air, OH groups are generated on a surface of the layer made of the metallic oxide;

a second step of coating the layer made of the metallic oxide with a dielectric layer while OH groups exist on the surface of the layer made of the metallic oxide;

a third step of preparing a second plate; and

a fourth step of placing the first plate and the second plate in parallel to face each other, with spacing means being placed between the first plate and the second plate, so that a discharge space is formed between the first plate and the second plate.

31. The method for producing a PDP defined in Claim 30, wherein

in the first step, either of a metal chelate and a metal alkoxide compound is used as a source material for the CVD method.

32. The method for producing a PDP defined in Claim 30, wherein

in the first step, a compound used as a source material for the CVD method is at least one of zinc,

zirconium, magnesium, titanium, silicon, aluminium, and chromium.

33. The method for producing a PDP defined in Claim 30, wherein

in the second step, the dielectric layer is made of one of a lead oxide glass whose dielectric constant is 10 or more and a bismuth oxide glass whose dielectric constant is 10 or more, wherein

the lead oxide glass includes lead oxide (PbO), boron oxide (B_2O_3), silicon oxide (SiO_2), and aluminum oxide (Al_2O_3), and the bismuth oxide glass includes bismuth oxide (Bi_2O_3), zinc oxide (ZnO), boron oxide (B_2O_3), silicon oxide (SiO_2), and calcium oxide (CaO).

34. A method for producing a PDP comprising:

a first step of attaching a first electrode made of a metal onto a main surface of a first plate and forming with oxidation a layer made of a metallic oxide on a surface of the first electrode;

a second step of coating the layer made of the metallic oxide with a dielectric layer;

a third step of preparing a second plate; and

a fourth step of placing the first plate and the second plate in parallel to face each other, with spacing means being placed between the first plate and the second plate, so that a discharge space is formed between the first plate and the second plate.

35. The method for producing a PDP defined in Claim 34, wherein

the oxidation in the first step is performed with an anodic oxidation method.

36. A method for producing a PDP comprising:

a first step of attaching a first electrode onto a main surface of a first plate and forming a dielectric layer on a surface of the first electrode with a vacuum process method;

a second step of preparing a second plate; and

a third step of placing the first plate and the second plate in parallel to face each other, with spacing means being placed between the first plate and the second plate, so that a discharge space is formed between the first plate and the second plate.

37. The method for producing a PDP defined in Claim 36, wherein

the dielectric layer formed in the first step is a compound including at least one of zirconium, titanium, zinc, bismuth, cesium, silicon, aluminium, antimony, and magnesium.

38. The method for producing a PDP defined in Claim 36, wherein

between the first step and the second step, there is a step for forming a magnesium oxide protecting layer for protecting the dielectric layer with a vacuum process method immediately after the dielectric layer is formed in the first step.

39. The method for producing a PDP defined in Claim 36, wherein

the vacuum process method used in the first step is a CVD method.

40. The method for producing a PDP defined in Claim 39, wherein

a compound is used as a source material for the CVD

method in the first step, the compound including at least one of zirconium, titanium, zinc, bismuth, cesium, silicon, aluminium, antimony, and magnesium.

41. The method for producing a PDP defined in Claim 36, wherein

the first plate used in the first step is made of borosilicate glass including 6.5% or less by weight of alkali.

42. A method for producing a PDP comprising:

a first step of attaching a first electrode onto a main surface of a first plate and forming a dielectric layer on a surface of the first electrode with a plasma spraying method;

a second step of preparing a second plate; and

a third step of placing the first plate and the second plate in parallel to face each other, with spacing means being placed between the first plate and the second plate, so that a discharge space is formed between the first plate and the second plate.

43. The method for producing a PDP defined in Claim 42,

wherein

a material for the plasma spraying method in the first step is one of a glass containing lead oxide (PbO), boron oxide (B_2O_3), silicon dioxide (SiO_2), and aluminium oxide (Al_2O_3), and a glass containing phosphorus oxide (P_2O_5) zinc oxide (ZnO), aluminium oxide (Al_2O_3), and calcium oxide (CaO), wherein

a thermal expansion coefficient of each of the glasses is in a range of $45X10^{-7}/°C$ to $50X10^{-7}/°C$.

44. The method for producing a PDP defined in Claim 42, wherein,

the first plate used in the first step is made of borosilicate glass including 6.5% or less by weight of alkali.

45. A method for producing a PDP comprising:

a first step of attaching a first electrode onto a main surface of a first plate, and forming with a plasma spraying method a plurality of partition walls on the main surface of the first plate, wherein at least a part of the first electrode is exposed;

a second step of preparing a second plate; and

a third step of placing the first plate and the second plate in parallel to face each other, with the plurality of partition walls being placed between the first plate and the second plate so that a discharge space is formed between the first plate and the second plate.

46. The method for producing a PDP defined in Claim 45, wherein

a source material for the plasma spraying method in the first step is at least one of aluminium oxide (Al_2O_3) and mullite ($3Al_2O_3 \cdot 2SiO_2$).

47. The method for producing a PDP defined in Claim 45, wherein

between the first step and the second step, a dielectric layer is formed to coat the main surface of the first plate on which the first electrode and the plurality of partition walls exist.

48. The method for producing a PDP defined in Claim 45, wherein

the first plate used in the first step is made of borosilicate glass including 6.5% or less by weight of

alkáli.

ABSTRACT

A PDP does not suffer from dielectric breakdown even though a dielectric layer is thin, with the problems of conventional PDPs, such as cracks appearing in the glass substrates during the production of the PDP being avoided. To do so, the surface of silver electrodes of the PDP is coated with a 0.1-10μm layer of a metallic oxide, on whose surface OH groups exist, such as ZnO, ZrO_2, MgO, TiO_2, Al_2O_3, and Cr_2O_3. The metallic oxide layer is then coated with the dielectric layer. It is preferable to form the metallic oxide layer with the CVD method. The surface of a metallic electrode can be coated with a metallic oxide, which is then coated with a dielectric layer. The dielectric layer can be made of a metallic oxide with a vacuum process method or the plasma thermal spraying method. The dielectric layer formed on electrodes with the CVD method is remarkably thin and flawless. When the dielectric layer is formed with the vacuum process method or the plasma spraying method, warping and cracks conventionally caused by baking the dielectric layer are prevented. Here, borosilicate glass including 6.5 % or less by weight of alkali can be used as the glass substrate.